UTAH
Department of Transportation

ACCELERATED
BRIDGE CONSTRUCTION

PHASE II: PRELIMINARY DEVELOPMENT WORKSHOP

Proposed Bulb Tee Girder Standards

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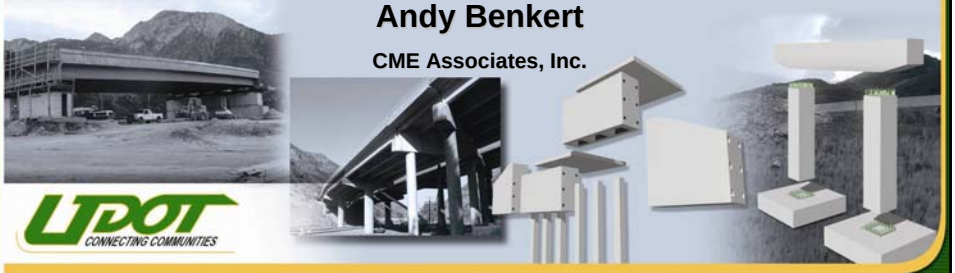
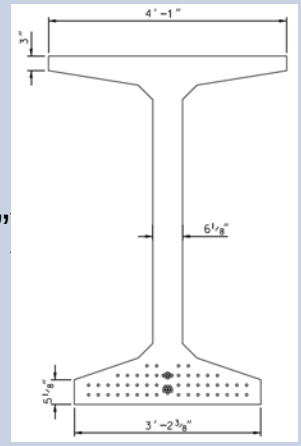


Current UDOT PS Girders

- Precast Prestressed AASHTO Girders
- Some butted voided slabs
- Bulb Tees were used on I-15 project
  - Design Build
- No formal standards

What is a Bulb Tee?

- Wide Top Flange (“Tee”)
  - More stable than I Beam
  - More efficient
- Large Bottom Flange (“Bulb”)
  - Can Handle more strand



Why Use a Bulb Tee?

- When compared to AASHTO I-Girders
  - More efficient
  - Lower shipping weight
  - Easier to ship (stability)
  - Fewer strand required
  - Less costly

Bulb Tee Girder Study

- Investigate other state standards
  - Do not start from scratch
  - Look at successful details
- Look into girder efficiency studies
- Engage industry experts

Girders Studied

- Washington DOT
- Colorado DOT
- Florida DOT
- New Mexico DOT
- Idaho DOT
- AASHTO/PCI
- Oregon DOT
- Nebraska DOT
- Northeast PCI
- Pennsylvania DOT

Girder Efficiency

Method 1:

$$\rho = \frac{r^2}{y_t y_b}$$

where

r = radius of gyration of section

y_t, y_b = distance from center of gravity to top and bottom fibers, respectively.

Method 2:

$$\alpha = \frac{3.46\ S_b}{Ah}$$

where

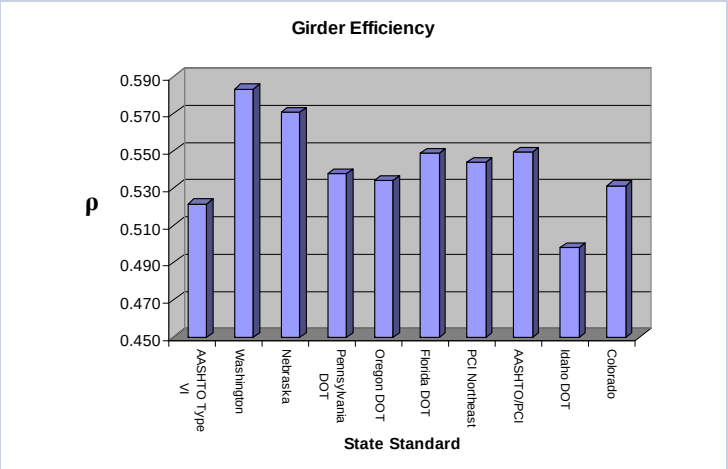
S_b = section modulus for bottom fibers

A = cross-sectional area

h = depth of section

UDOT CONNECTING COMMUNITIES

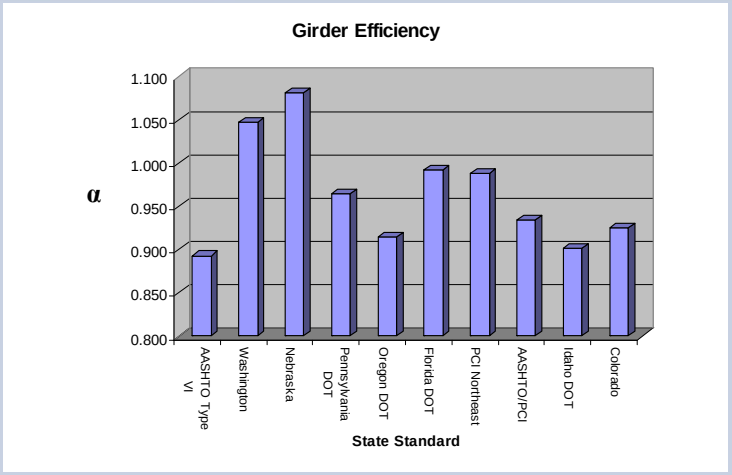
Girder Efficiency



UDOT CONNECTING COMMUNITIES

Method 1:

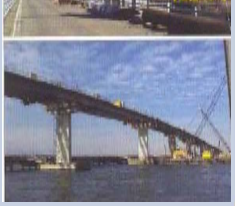
Girder Efficiency



Method 2:

Girder Splicing

- Method Used to Extend spans
  - Spans have been built over 240 feet in other states
- Uses internal post tensioning
- Requires special end blocks
  - Anchorage assemblies



Washington DOT Approach

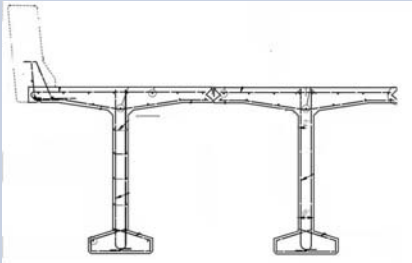
- Girders <190 kips: Pretensioned only
- Girders > 240 kips: Post-tensioned only
- 190 kips < Girders < 240 kips: Contractor Option
- Based on Shipping and Handling Limits

Girder Comparison

- Washington DOT Girders showed the most promise
- Other girders were compared
  - Dimensionally
  - Track record
  - Ease of fabrication

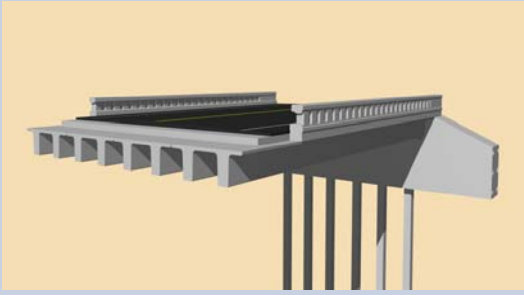
Deck Bulb Tee Options

- Used in several states for low volume roads
  - ADT < 30,000 typically
- Butted system that does not require deck casting
- Several states use welded tie details
- New research coming on grouted joints



Short Span Bridges

- Northeast NEXT Beam
- 24”-36” deep
- Can span up to 90 feet
- Deck option available



Conclusions & Recommendations

- Washington DOT WF Series Girders were the best overall girder
  - Very efficient section
  - Wash DOT gathered input from fabricators
  - Very complete girder standards have been developed
    - Spliced girders and deck girders
  - Span limits have been pushed to the limit
    - (over 200 foot)

Other Recommendations

- Use Wash DOT fabrication options for long span girders
- Limit maximum concrete strength to 10 ksi
  - No significant benefit beyond this
- No longer use AASHTO Girders
  - UDOT Commitment to new section
- Establish Bridge Technical Committee
  - State/Consultants/Fabricators/PCI


Questions?
UDOT
CONNECTING COMMUNITIES